

Name: _____

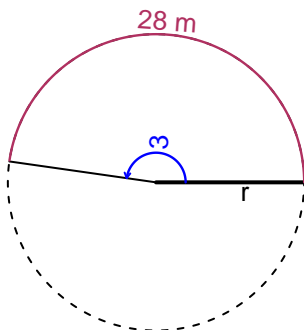
Date: _____

Trig Final (Solution v36)

- You can use a calculator (like [Desmos](#))
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 3 radians. The arc length is 28 meters. How long is the radius in meters?

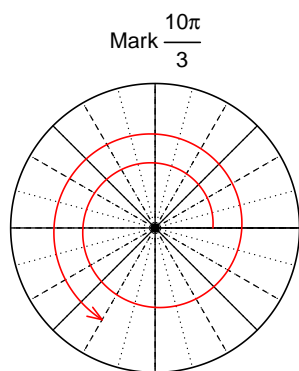


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$r = 9.333$ meters.

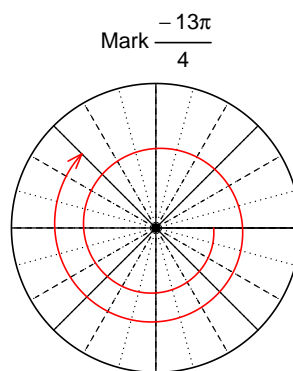
Question 2

Consider angles $\frac{10\pi}{3}$ and $\frac{-13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{10\pi}{3}\right)$ and $\sin\left(\frac{-13\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(10\pi/3)$

$$\cos(10\pi/3) = \frac{-1}{2}$$



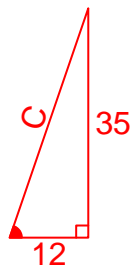
Find $\sin(-13\pi/4)$

$$\sin(-13\pi/4) = \frac{\sqrt{2}}{2}$$

Question 3

If $\tan(\theta) = \frac{-35}{12}$, and θ is in quadrant II, determine an exact value for $\cos(\theta)$.

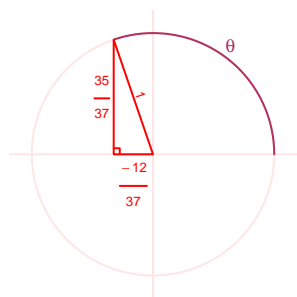
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}12^2 + 35^2 &= C^2 \\ C &= \sqrt{12^2 + 35^2} \\ C &= 37\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\cos(\theta) = \frac{-12}{37}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 3.81 meters, a midline at $y = -6.58$ meters, and a frequency of 8.38 Hz. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.81 \sin(2\pi 8.38t) - 6.58$$

or

$$y = -3.81 \sin(16.76\pi t) - 6.58$$

or

$$y = -3.81 \sin(52.65t) - 6.58$$